

PLASMA CHOLESTEROL AND TRIGLYCERIDES IN OBESE SMOKERS

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ABSTRACT

Influence of smoking, obesity, and body fat distribution on serum lipids, and lipoproteins have extensively been studied. However, there is still a controversy regarding the role of cholesterol and triglycerides in obese smokers. In view of that, this study was conducted in male students attending Umm Al-Qura University and other institutions in Makkah. The results show that the significant differences in plasma levels of total cholesterol, HDL-C, LDL-C and triglycerides in obese smoking subjects exist as compared to non-obese non-smoking control subjects. The current study was planned with appropriate control group and the clinical, physiological criteria were obeyed for obtaining information. However, further studies might clarify the subject with additional better controlled studies.

Key words: Obesity, smoking, obese smokers, lipid profile

INTRODUCTION

Obesity is associated with high prevalence of metabolic disturbances. Severe obesity is hence expected to have more important metabolic changes than moderate obesity (Drapeau *et al.*, 2006). Obesity and overweight may accompany the unfavorable blood lipids patterns and in a considerable proportion of overweight or obese patients other risk factors like smoking, hypertension, diabetes or familial cardiovascular diseases may coexist (Szczygielska *et al.*, 2003). Studies related to lipid metabolism, abdominal obesity and hyperinsulinemia (Ward *et al.*, 1994; Wang *et al.*, 2011), relationship of nicotine and body weight (Hur *et al.*, 2010; Botella-Carretero *et al.*, 2004), and weight gain after cessation of smoking (Jensen *et al.*, 1995) have provided important information to predict the role of lipids in obese smokers.

Other studies related to the influence of smoking and obesity on lipids (Haarbo *et al.*, 1990; Mataix *et al.*, 2005), total cholesterol, HDL cholesterol and LDL cholesterol (Ródenas *et al.*, 1989; Drapeau *et al.*, 2006; Bossola *et al.*, 2008; Kassi *et al.*, 2009), triglycerides (Bossola *et al.*, 2008; Kassi *et al.*, 2009), and TG and HDL-C levels (Yamamoto *et al.*, 2003; Arslan *et al.*, 2008; Kassi *et al.*, 2009; Wang *et al.*, 2011) provided valuable information of the type of lipids involved in smoking and obesity.

Smoking subjects having history of obesity and other complications showed the mean serum total cholesterol and LDL cholesterol significantly higher in smokers whereas mean serum HDL-Cholesterol significantly lower (Sinha *et al.*, 1995). Mean triglyceride was found significantly higher in smokers than in nonsmokers. This is evident in another study where the smokers had significantly higher levels of triglycerides, low LDL-C, and higher LDL-C/HDL-C but lower levels of HDL-C (Haarbo *et al.*, 1990). Men with coronary artery disease having higher rate of cigarette smoking had higher concentrations of triglycerides in their plasma and LDL-C; as well as somewhat lower levels of HDL-C (Steiner *et al.*, 1987). However, analysis of stepwise logistic regression rejected the association between coronary artery disease and HDL cholesterol, plasma triglyceride, VLDL triglyceride, or LDL triglyceride, though it showed that coronary artery disease was most strongly associated with smoking (Steiner *et al.*, 1987).

Controversial results were reported by various investigators for the study of total cholesterol, LDL-C, HDL-C and triglycerides in obese smoking male subjects. In view of that, it was planned to investigate the level of variation of lipid profile in these subjects.

MATERIALS AND METHODS

All subjects studied in the present study were the male obese smokers (n: 46) and male controls (n: 44). These subjects (obese smokers and controls) were consulted in Umm Al-Qura University and related institutions in Makkah, Saudi Arabia.

The age range of these subjects was 17-27 years (mean: 23 years). The obese smokers in this group were those smoking 3-5 cigarettes/day with an average of 4 cigarettes/day; and the average duration of the smoking habit was 2.0 years.

Descriptions of the smoking habits, body weight and height, criteria for the evaluation of subjects with obesity, and other physical/ physiological measurements/ information in the form of a standard questionnaire were obtained

before collecting blood for the estimation of plasma cholesterol, LDL-C, HDL-C and triglycerides by routine methods in obese smokers and controls (non-smoking non-obese male subjects). Each subject provided the details of his age, blood pressure, BBT, and other physical measurements. The criteria of the selection of obese smokers was that no one should have the medical complication such as hypertension, ischemic heart disease, stroke, diabetes or any such other disorder. Hence, all male subjects included in the present study are the normal healthy subjects except that the study group comprised subjects with confirmed obesity. The data was collected and analyzed statistically using student t test. The significance value (p) for various comparisons was found and the results were interpreted.

RESULTS AND DISCUSSION

Alterations of lipid profile in obese smoking male students were evaluated. The obese smoking subjects (n:46) were compared with non-obese non-smoking subjects (n:44). The mean \pm SD values (mg/ dl) for serum cholesterol, LDL-C, HDL-C and triglycerides in obese smokers were 232.41 \pm 36.49, 129.67 \pm 33.02, 48.43 \pm 29.45 and 168.97 \pm 20.67, respectively (Table 1). These values respectively for the control group were 201.54 \pm 39.23, 102.35 \pm 32.27, 68.82 \pm 32.22 and 142.56 \pm 21.28.

The comparisons showed all lipid profile parameters of obese smokers were significantly different from those in control subjects (Table 1). Total cholesterol, LDL-C and triglycerides increased significantly whereas HDL-C decreased significantly in obese smokers group when compared with the non-obese non-smokers control group.

The present findings are similar to several previous investigators, and differ as well in certain aspects. A collective influence of smoking and obesity has shown similar changes in serum lipids in a previously conducted study (Haarbo *et al.*, 1990) and a later report (Bossola *et al.*, 2008). Another group of workers (Mataix *et al.*, 2005) did not obtain such results as in that study it was found that obesity or the lifestyle did not alter significantly the mean plasma lipid values, and the lipid levels were found in the normal range. They showed that in obese smokers the levels of HDL-cholesterol were found lower compared to that in obese nonsmokers.

Furthermore, the risk of hypercholesterolemia and high LDL-C levels was associated only with age, and the risk of low levels of HDL-C levels was associated only with high waist circumferences. (Mataix *et al.*, 2005). They further explained that the age but not BMI were associated with a risk of dyslipidemia. No dietary associations were found in this study between energy or macronutrient intake and plasma lipids in overweight or obese individuals (Mataix *et al.*, 2005).

Table 1. Lipids profile in obese smoking male students.

Blood levels	Control (n: 44)	Obese smokers (n: 46)	Significance (p)
Cholesterol (mg/dl)	201.54 \pm 39.23 *5.914	232.41 \pm 36.49 *5.380	p< 0.0002
LDL-C (mg/dl)	102.35 \pm 32.27 *4.865	129.67 \pm 33.02 *4.868	p< 0.0001
HDL-C (mg/dl)	68.82 \pm 32.22 *4.857	48.43 \pm 29.45 *4.342	p< 0.0023
Triglycerides (mg/dl)	142.56 \pm 21.28 *3.208	168.97 \pm 20.67 *3.048	p< 0.0001

The values are mean \pm SD; n: number of subjects; *, Standard Error (SE)

The results obtained for HDL-C in the present study are similar to Mataix *et al.* (2005), though the interpretations of the present work do not follow that approach. The current study was planned with appropriate control group and the clinical and physiological criteria were obeyed for obtaining valuable information. However, further studies

might clarify with additional better controlled studies to understand the role of obesity and smoking in altering the lipid metabolism.

REFERENCES

- Arslan, E., T. Yakar and I. Yavaşoğlu (2008). The effect of smoking on mean platelet volume and lipid profile in young male subjects. *Anadolu Kardiyol Derg.*, 8(6):422-5.
- Bossola, M., S. Giungi, N. Panocchia, C. Vulpio, G. Luciani and L. Tazza (2008). Body mass index and cardiovascular risk factors and biomarkers in hemodialysis patients. *J. Nephrol.*, 21(2):197-204.
- Botella-Carretero, J.I., H.F. Escobar-Morreale, I. Martín, A. M. Valero, F. Alvarez, G. García, C. Varela and M. Cantarero (2004). Weight gain and cardiovascular risk factors during smoking cessation with bupropion or nicotine. *Horm. Metab. Res.*, 36(3):178-82.
- Drapeau, V., I. Lemieux, D. Richard, J. Bergeron, A. Tremblay, S. Biron, P. Marceau and P. Mauriège (2006). Metabolic profile in severely obese women is less deteriorated than expected when compared to moderately obese women. *Obes. Surg.*, 16(4):501-9.
- Haarbo, J., C. Hassager, A. Schlemmer and C. Christiansen (1990). Influence of smoking, body fat distribution, and alcohol consumption on serum lipids, lipoproteins, and apolipoproteins in early postmenopausal women. *Atherosclerosis*, 84(2-3):239-44.
- Hur, Y. N., G.H. Hong, S.H. Choi, K. H. Shin and B. G. Chun (2010). High fat diet altered the mechanism of energy homeostasis induced by nicotine and withdrawal in C57BL/6 mice. *Mol. Cells*, 30(3):219-26.
- Jensen, E.X., C. Fusch, P. Jaeger, E. Peheim and F.F. Horber (1995). Impact of chronic cigarette smoking on body composition and fuel metabolism. *J. Clin. Endocrinol. Metab.*, 80(7):2181-5.
- Kassi, E., M. Dalamaga, E. Faviou, G. Hrousalas, K. Kazanis, Ch. Nounopoulos and A. Dionyssiou-Asteriou (2009). Circulating oxidized LDL levels, current smoking and obesity in postmenopausal women. *Atherosclerosis*, 205(1):279-83.
- Mataix, J., M. López-Frías, E. Martínez-de-Victoria, M. López-Jurado, P. Aranda and J. Llopis (2005). Factors associated with obesity in an adult Mediterranean population: influence on plasma lipid profile. *J. Am. Coll. Nutr.*, 24(6):456-65.
- Ródenas, S., C. Martin, C. Cuesta and F. Peco (1989). Lipemia and apolipoproteinemia B in overweight, smoking men aged 30 to 55 years. *J. Pharm. Belg.*, 44(4):270-4.
- Sinha, A. K., G.C. Misra, and D.K. Patel (1995). Effect of cigarette smoking on lipid profile in the young. *J. Assoc. Physicians India*, 43(3):185-8.
- Steiner, G., L. Schwartz, S. Shumak and M. Poapst (1987). The association of increased levels of intermediate-density lipoproteins with smoking and with coronary artery disease. *Circulation*, 75(1):124-30.
- Szczygielska, A., S. Widomska, M. Jaraszkiwicz, P. Knera and K. Muc (2003). Blood lipids profile in obese or overweight patients. *Ann. Univ. Mariae Curie Skłodowska Med.*, 58(2): 343-9.
- Wang, J. W., D.Y. Hu, Y. H. Sun, J. H. Wang and J. Xie (2011). Gender difference in association between smoking and metabolic risks among community adults. *Zhonghua Yi Xue Za Zhi.*, 91(12):805-9.
- Ward, K.D., D. Sparrow, P.S. Vokonas, W.C. Willett, L. Landsberg and S. T. Weiss (1994). The relationships of abdominal obesity, hyperinsulinemia and saturated fat intake to serum lipid levels: the Normative Aging Study. *Int. J. Obes. Relat. Metab. Disord.*, 18(3):137-44.
- Yamamoto, A., H. Temba, H. Horibe, H. Mabuchi, Y. Saito, Y. Matsuzawa, T. Kita and H. Nakamura (2003). Research Group on Serum Lipid Survey 1990 in Japan. Life style and cardiovascular risk factors in the Japanese population--from an epidemiological survey on serum lipid levels in Japan 1990 part 1: influence of life style and excess body weight on HDL-cholesterol and other lipid parameters in men. *J. Atheroscler. Thromb.*, 10(3):165-75.

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